N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**

A \[ \rightarrow \] B
Pressure \[ \rightarrow \] Ulcer

**Multicausality**

Years smoking
High fat diet \[ \rightarrow \] Heart disease
Limited exercise \[ \rightarrow \] Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

1. Is there a treatment?
   - No
   - Yes

2. Is the primary purpose examination of relationships?
   - No
   - Yes

3. If No:
   - Descriptive Design
   - Will the sample be studied as a single group?
     - No
     - Yes
     - Correlational Design

4. If Yes:
   - Quasi-Experimental Study
   - Will a randomly assigned control group be used?
     - No
     - Yes
     - Is the original sample randomly selected?
       - No
       - Yes

Experimental Study
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - Yes
      - Following same subjects across time?
        - Yes
          - Single unit of study
            - Case Study
        - No
          - Studying events partitioned across time?
            - Yes
              - Longitudinal Study
            - No
              - Trend Analysis
                - Repeated measures of each subject
                  - Yes
                    - Longitudinal design with treatment partitioning
                  - No
                    - Cross-sectional design with treatment partitioning
    - No
      - Comparative Descriptive Design

- Yes
  - Descriptive Design

Research Design

Cross-sectional design with treatment partitioning

Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

Variable 1 ➔ Description of Variable 1

Variable 2 ➔ Description of Variable 2

Variable 3 ➔ Description of Variable 3

Variable 4 ➔ Description of Variable 4

Interpretation of Meaning ➔ Development of Hypotheses
A Comparative Descriptive Design

Group I {variables measured} → Describe → Comparison of Groups on Selected Variables → Interpretation of Meaning

Group II {variables measured} → Describe → Development of Hypotheses
## Selecting the Type of Correlational Design

<table>
<thead>
<tr>
<th>Describe relationships between/among variables?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive correlational design</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Predict relationships between/among variables?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictive correlational design</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test theoretically proposed Relationships?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model testing design</td>
</tr>
</tbody>
</table>
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Description of variable

Research Variable 2

Development of Hypotheses
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Control Group?
- No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Comparison with population values?
        - Yes
          - Repeated Measures?
            - No
              - Strategy for Comparison
                - Yes
                  - Suggest Reevaluating design
                - No
                  - One group pretest/post-test design
        - No
          - One group pretest/post-test design
  - Yes
    - Pretest?
      - No
        - Repeated Measures?
          - Yes
            - Compare treatment & control conditions?
          - No
            - Suggest Reevaluating design
      - Yes
        - One group pretest/post-test design
Selecting The Type of Experimental Design

- **Pretest**
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Pretest/post-test control group design
          - Yes
            - Blocking?
              - No
                - Randomized clinical trials
              - Yes
                - Comparison of multiple levels of treatment
                  - No
                    - Examination of complex relationships among variables in relation to treatment
                  - Yes
                    - Nested Designs

- Research Design
Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Instrumentation

**Mortality:**
- Restricted generalizability as control increases
### Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Randomly selected experimental group</strong></td>
<td><strong>TREATMENT</strong></td>
</tr>
<tr>
<td><strong>Randomly selected control group</strong></td>
<td><strong>POST-TEST</strong></td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
<table>
<thead>
<tr>
<th>Pain Control Management</th>
<th>Primary Nursing Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Care</td>
</tr>
<tr>
<td></td>
<td>Unit A</td>
</tr>
<tr>
<td>Traditional care</td>
<td>Unit A</td>
</tr>
<tr>
<td>PRN Medication</td>
<td>Unit B</td>
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<tr>
<td></td>
<td>Unit C</td>
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<td></td>
<td>Unit D</td>
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<tr>
<td>New approach: “Around the clock” medication</td>
<td>Unit E</td>
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<td>Unit F</td>
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<td>Unit G</td>
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<td>Unit H</td>
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</table>
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design